pansion or excessive wet expansion with the same mixes.

Additionally, certain hydraulic/gypsum formulations which are regarded as volume stable behave unexpectedly in both the wet and dry state when mixed with certain latex emulsions to become useless unless otherwise controlled with wet expansion inhibitors and/or drying shrinkage inhibitors. Furthermore, very low absorption and low permeability cementitious mixtures have been invented by adding gypsum to certain hydraulic cements with a polymer modifier and mixes with water cement ratios as low as 20% while still maintaining workability.

In addition, cementitious mixtures utilizing this invention can be formulated to produce crack-free, low water permeability, self-curing, high bonding, long term durability, freeze/thaw resistant mixtures which are volume stable and can be used for, but are not limited to, plastering, finishing, tuck-pointing, tile grouting, topping, patching, crack repair, topping, resurfacing, sealing, weatherproofing, moisture protection, dampproofing and concrete which can be applied to concrete, masonry, brick, stone, rock and tile and the like with the required compatibility, breatheability, thermal coefficient of expansion, and volume stability to eliminate debonding, blistering, cracking, and reduce moisture penetration. In addition, this invention provides coatings and adhesives of such dimensional stability and compatability that they can be applied to foam glass without causing the coating to pit, break, or rip the surface of the foam glass due to excesive volume change.

Additional admixtures such as retarders, accelerators, surfactants, defoamers, water reducing agents, stearates, waterproofers, pigments, fillers, sands, aggregates, fly ash, fume silica, chemical and physical blowing agents, thixotropes, whiteners, and thickeners may also be added to either the dry cement mix or the emulsion or mixing water to produce the desired results.

EXAMPLES

The scope of the invention is further described in connection with the following examples which are set forth for purposes of illustration only and are not to be construed as limiting the scope of the inventon in any manner.

EXAMPLE NO. 1

A cement mixture of lumnite, a high alumina cement, gypsum and sand in a ratio of 40/10/50 were mixed with 83.3 ml of water. After one day, the dry cured bar expanded +11 and the wet cured bar expanded +846. Another cement mixture of the same composition was mixed with a combination of water and a BASF styrene acrylate latex emulsion. After one day, the dry cured bar expanded to +2610. This illustrates the significant and potentially detrimental amount of expansion effect a particular latex emulsion can have on certain hydraulic cement/gypsum compositions. Although the latex may improve certain properties in mixes such as bond strength, it is effectively useless due to the large volume changes.

EXAMPLE NO. 2

Using the same cement mixtures as described in Example No. 1, a lithium salt (lithium carbonate) in the amount of 0.07 g per 500 g cement mix was added. To this cement mix was added the same amounts of water and latex emulsion as described in Example No. 1. The one day dry cured bar expanded only +263. Another mix of the same composition was prepared except 0.1 g of lithium carbonate was added which resulted in a dry cure expansion in one day of +219. This illustrates the controlling effect lithium salt has on an otherwise unsound mixture.

EXAMPLE NO. 3

A cement composition of lumnite, gypsum and a drying shrinkage inhibitor, Portland cement, and a wet expansion inhibitor of a lithium salt (lithium carbonate) and sand were mixed in a ratio of 35/7.5/7.5/0.067/50. This mixture was mixed with the BASF styrene acrylate latex emulsion and water in the same proportions as in the example above. In one day the wet expansion was controlled to only +92 and the dry cured bar expanded only +92 and the dry cured bar expanded only +68. This demonstrates that the utilization of drying shrinkage inhibitors and wet expansion inhibitors can be useful in controlling certain hydraulic cement/gypsum/latex mixtures.

EXAMPLE NO. 4

The same cement mixture as in Example No. 1 was mixed with water and an acrylic latex, provided by Reichold Chemicals in the same proportions as described above. At one day the cure bar shrank −124 while the wet bar expanded +680. Another cement mixture of the same composition was mixed with a carboxylated styrene butadiene latex emulsion, provided by Reichold Chemicals, mixed with water in the same proportions as above. After one day the dry bar shrank −140 while the wet bar expanded and cracked. This illustrates again the unexpected effects latexes have on the soundness and length changes of such cement mixtures.

EXAMPLE NO. 5

Another cement mixture of the same compositions as Example No. 1 was mixed with styrene butadiene latex emulsions supplied by Polysar and mixed in the same proportions as above. At three days the dry shrinkage was −390. Another cement mixture of the same composition was mixed with an acrylic latex emulsion, supplied by Rohm & Haas in the same proportions as above, resulting in three day shrinkage of −124. This illustrates again the unexpected effects different latex emulsions have on nonPortland hydraulic cement/gypsum cement mixtures as opposed to Portland cement mixtures alone.

While it is apparent that the invention herein disclosed is well calculated to fulfill the objects above stated, it will be appreciated that numerous modifications and embodiments may be devised by those skilled in the art, and it is intended that the appended claims cover all such modifications and embodiments as fall within the true spirit and scope of the present invention.

Having thus described our invention, what we claim as new and desire to secure by Letters Patent is:

1. A method for reducing the wet expansion and drying shrinkage of an aluminous cement which comprises adding thereto:

(a) gypsum in an amount above about 5 to about 55 percent by weight based on the amount of the aluminous cement to reduce drying shrinkage; and

(b) a first polymer latex emulsion such that the percent polymer solids based on the amount of the